WILDLIFE MANAGEMENT AND RESEARCH NOTES

No.		DATE
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	TITLE: Waterfowl Population Surveys	

Abstract: *The peak number of ducks observed in Indiana's Weekly Waterfowl Inventory during fall and winter had consistently decreased since 1999, but seems to have leveled off in the last few years. Harvest has an increasing trend. Two hundred twelve plots were surveyed for geese and duck during April 2008. The estimated statewide population of breeding giant Canada geese (*Branta canadensis*) was 102,700 during the 2008 breeding season. The estimated number of breeding pairs was 49,131. These estimates include geese in urban areas. No estimate of mallard breeding population was possible this year, due to large numbers of migrants remaining in the state during the survey period.*

History

The objective of this study was to provide annual spring population estimates, within ± 25%, of breeding Canada geese and ducks in Indiana, and to provide an annual index of fall and winter migratory waterfowl populations in Indiana. We use three different surveys for these purposes. The Weekly Waterfowl Inventory (WWI) is conducted in the fall and winter to track migration. The Spring Canada Goose Survey is an aerial survey to count breeding Canada geese in the state. Finally, the Spring Duck Survey is an aerial survey, conducted at the same time as the Canada Goose survey, to count breeding ducks.

Methods

2007-2008 Weekly Waterfowl Inventory. Waterfowl and other wetland-associated migratory birds are counted weekly from late August through late January on participating state fish and wildlife areas, reservoirs, national wildlife refuges and select private lands. Modes of transportation vary by property (i.e., automobile, boat, or walking), but all participants count all waterfowl seen on established routes. Participants conduct counts early in the week to avoid duplicate counting of the same birds at different areas.

2008 Spring Canada Goose Survey. This survey is normally conducted during the peak incubation period (early- to mid-April). This year the surveys were flown on 14, 16, 18, 22, 24, and 29 April 2008. The state is divided into low (0-1 breeding pairs), medium (2-4 breeding pairs), and high goose density (more than 5 breeding pairs) plots. These

divisions are based on a combination of a 1992 estimate of goose density across the state and updates provided from annual survey results. These data are housed in a GIS, which divides the state into 1 mi^2 plots and allows for annual updates from survey data. Survey plots are 2 mi^2 (1 mi x 2 mi) and are maintained using a DeLorme mapping system. During flight, the mapping system is integrated with a GPS to aid navigation. Surveys are flown from a helicopter during favorable weather conditions (winds ≤ 15 mph, survey not conducted or is discontinued if moderate to heavy rain, fog, or snow occurs) (USFWS and CWS 1987).

For the third time this year, an urban survey was performed for breeding Canada geese. Urban areas were selected in ArcGIS. The following areas were selected for this year's surveys: northwest Indiana (St. John to Gary); South Bend and Mishawaka; Ft. Wayne; Muncie; Anderson; Indianapolis; Kokomo; Terre Haute; Lafayette; Bloomington; Clarksville; and Evansville. In addition, Vincennes was surveyed separately (see below). Stratified random points were then selected from the high/medium/low density network of points described above. Four high density, 14 medium-density, and 20 low-density routes, along with six routes in the Vincennes area (described below), were selected. Points of the same density were connected using roadways within the urban zones. Routes were surveyed by three individuals, who performed the Vincennes survey together to calibrate their observation methods. All geese within 100m of the roadway were counted. The area surveyed and densities of geese were calculated to estimate urban populations.

Vincennes was surveyed via road separately. Due to a special agreement with the city of Vincennes, an intensive (six route) survey was undertaken there to determine goose populations before and after a new management regime in the city. This survey will be discontinued in 2009.

All Canada geese seen are categorized as one of the following categories: single with a nest; single with no nest; pairs with a nest; pairs with no nest; or group. The number of indicated breeding pairs in each plot is determined by summing the number of pairs with a nest and either the number of singles or the number of singles with a nest (whichever is greatest).

2007 Spring Duck Survey. As a result of limited funding, this survey is typically conducted in conjunction with spring Canada goose surveys. These surveys normally occur in early- to mid-April, at a time when many ducks are beginning incubation. Unfortunately, this is also a time when there are usually migrant ducks still in the state. Duck counts are conducted in the same plots as the spring Canada goose survey.

Results

2007-2008 Fall and Winter Survey. Wetlands were in good condition going into the breeding season. However, a drought that began in late spring and continued all summer affected brood rearing habitat in nearly every part of the state. Conditions were unusually warm well into October. The rest of the season alternated between extremely cold and extremely warm, and was probably slightly warmer than average overall. Indiana finally

began getting good amounts of rain in late October and early November. Even so, many natural wetlands did not fill until mid to late December. Early January brought tremendous rain events statewide and caused record flooding in parts of northern Indiana, especially along the Kankakee River. Most rivers were running full or flooded during most of January, providing ample habitat for migrating waterfowl statewide, especially on private lands. However, in the North and South Zones, this rain came too late to benefit river bottom hunters, as it began after the North Zone had closed and just as the South Zone's season was wrapping up.

Weekly waterfowl counts were performed on state properties and national wildlife refuges, 29 August to 30 January. Most waterfowl counts increased over both the 2006 estimates and the five-year average (Table 1).

Overall dabbler counts are driven by mallard numbers in the state (Figures 1, 2, 8a). Mallards peaked in mid-December, the same week as during 2005 and 2006 (Figure 2). The peak mallard count was 25,832, up 37% from 2006, and up 48% from the 5-year average. Wood ducks peaked the first week of September, five weeks earlier than in 2006 (Figure 3). The peak wood duck count was 5,406, up 12% from 2006 and 22% from the 5-year average. The peak black duck count of 1,041 occurred during the first week of December, the same week as in 2006 (Figure 4). The number of black ducks increased 67% from 2006 and was up 35% from the 5-year average. Green-winged teal peaked at 1,102, which was 13% lower than 2006 but up 82 birds (8%) from the 5-year average. Peak numbers of green-winged teal were observed in late October, about two weeks later than 2006. Blue-winged teal peaked during the first week of October, which was one week later than 2006. The peak count of blue-winged teal (1,117) was only 112 birds higher than the 2006 peak count, and 11% higher than the 5-year average. The combined teal migration data are shown in Figure 5. Divers peaked during the first week of December at 2,180 birds, three weeks later than 2006 (Figure 6). This was a 15% decrease from 2006, and a 14% decrease from the 5-year mean.

Canada goose migration through Indiana peaked at 12,789 observed birds the week of 30 January, nearly two months later than 2006, but in line with other recent years (Figure 7). The South Zone peaked the week of 30 January at 7,797 birds, more than twice the peak South Zone count of 2006. The statewide peak of 12,789 was 47% higher than 2006, and 24% above the 5-year average.

2008 Spring Canada Goose Survey. A total of 22 high-density plots, 77 medium-density plots, and 113 low-density plots were surveyed during 14, 16, 18, 22, 24, and 29 April 2008. In addition, 38 urban road surveys were driven in early to mid-April. The estimated statewide population of giant Canada geese was 102,700 (95% CI 31,850) compared to 125,300 (95% CI 37,561) in 2007 (Table 2). The estimated number of breeding pairs was 49,131 (CI ± 15,231), compared to 56,375 (CI ± 17,250) in 2007.

2008 Spring Duck Survey. Large numbers of migrant ducks remained in Indiana during the survey period in 2008. Because separation of migrant mallards from Indiana breeders

is not possible under these conditions, breeding duck estimates were not derived again this year.

Discussion and Recommendations

The peak numbers of waterfowl observed on the survey areas had been decreasing since the late 1990s, although duck counts have been rebounding or stabilizing in the last 1 – 3 years, depending on zone (Figures 8a and b). This could be related to birds spending time off of traditionally surveyed areas (that is, spending more time on private land, such as power company cooling ponds, than on public lands containing good habitat). Because harvest has not decreased over the same period, it seems unlikely that we are actually seeing fewer birds pass through Indiana (Figures 9 and 10).

The weekly count numbers are likely not representative of the number of ducks and geese in the state by early January 2008, as many rivers were flooded, forming backwater areas that are heavily used by waterfowl but not surveyed. There remains some concern with both managers and hunters that the survey we use to determine migration timing is becoming less accurate over time. For most of this season it was likely a reasonable index, due to the lack of flooded river bottoms before January. The limiting factor seems to be flooding: In years of heavy flooding, Indiana holds far more birds than are counted.

We continue operating under the assumption that the weekly waterfowl counts are a useful index to waterfowl migration: it seems unlikely that numbers and/or species peak at different times on surveyed properties than they do on other areas. The only time that the survey is problematic is when all surveyed areas are frozen but other areas are not. However, during these times, most waterfowlers are unable to hunt anyway, since open areas are likely on the rivers, which require specialized equipment. An evaluation of available waterfowl winter habitat on state-owned properties needs to occur. The possibility of conducting statewide waterfowl surveys should be considered, though it is likely that comprehensive statewide surveys would be prohibitively expensive.

The 2008 Canada goose breeding survey was timed very well, though beginning one week earlier would probably be even better. It is crucial that the surveys continue to be flown in April, and that at least six flights are conducted to get the necessary sample size to have confidence in the estimates.

Spring duck surveys have been combined with goose surveys since 2003. The duck surveys should be separated from the goose surveys, because the goose surveys occur too early in the season to reliably provide estimates of breeding ducks. These duck surveys should be flown during the middle two weeks of May. Efforts should be made to fly two separate sets of surveys in each spring: one set in April for geese, and another in May for breeding ducks. However, large increases in the cost of flight time will likely preclude this.

The practice of only estimating the breeding population of mallards north of 41° latitude has been discarded, since mallards now consistently breed statewide. We will continue to

estimate breeding populations for northern areas and statewide separately for the foreseeable future, when it is possible to derive population estimates for ducks at all.

To increase the accuracy of the breeding goose survey, methods should continue to be refined to target the urban resident goose population that cannot be surveyed from the air. This will largely include increasing the sample size of routes sampled in these areas until an acceptable 95% confidence interval is reached.

Literature Cited

USFWS (U.S. Fish and Wildlife Service) and CWS (Canadian Wildlife Service). 1987. Standard operating procedures for aerial waterfowl breeding ground population and habitat surveys in North America.

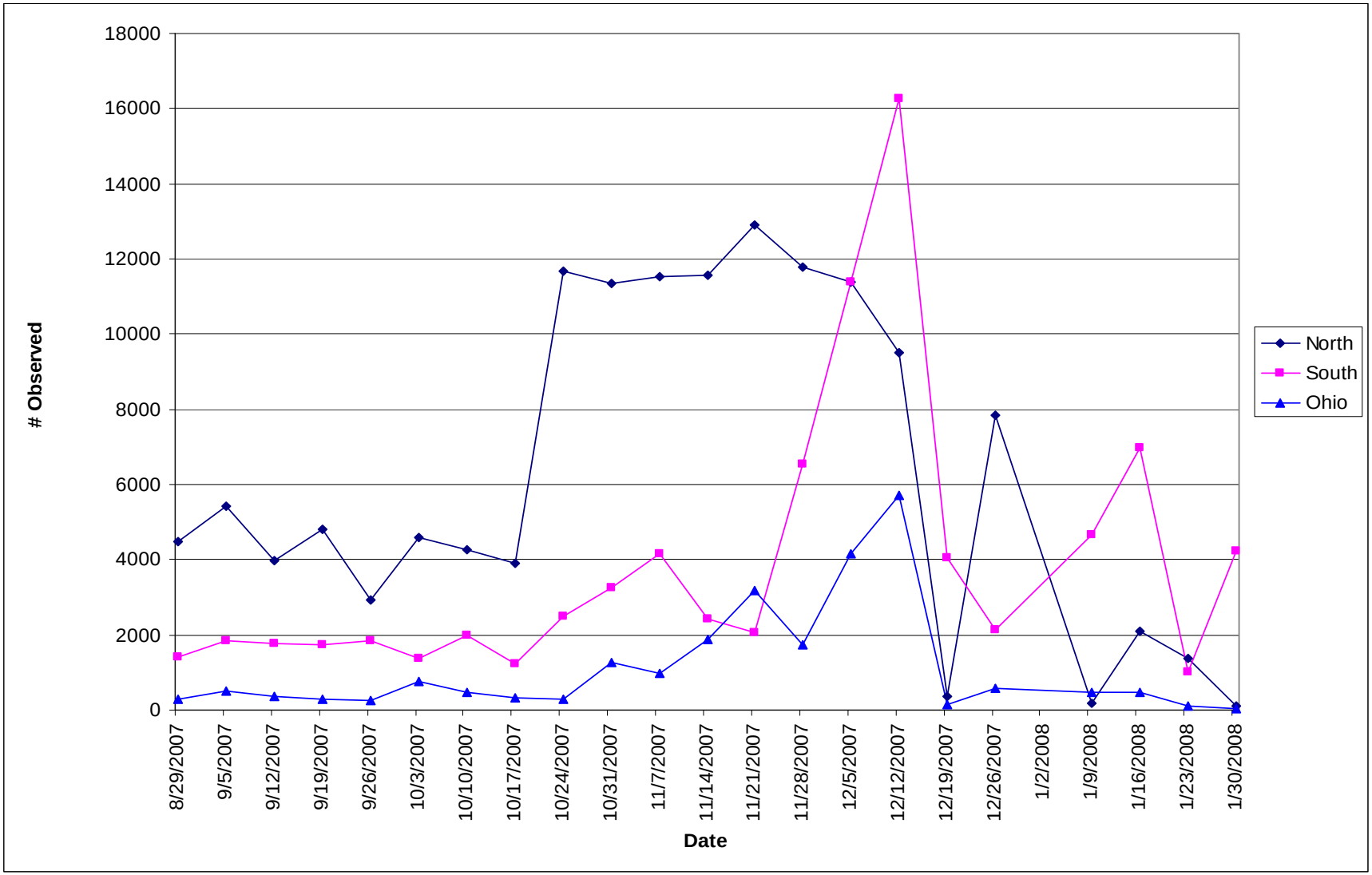

Figure 1. Migration timing of all dabbling ducks in Indiana by zone between 29 August 2007 and 30 January 2008.

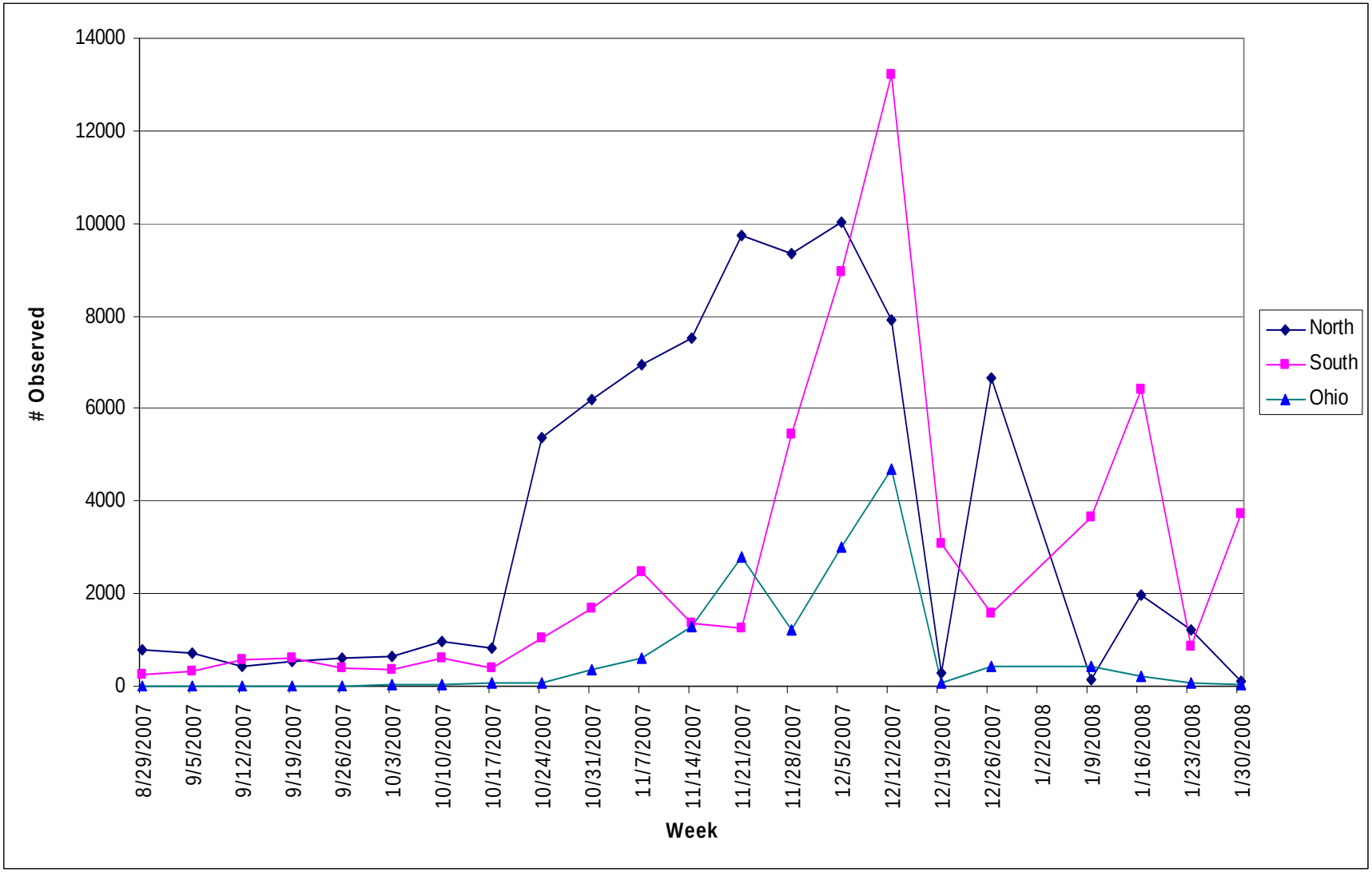

Figure 2. Migration timing of mallards in Indiana by zone between 29 August 2007 and 30 January 2008.

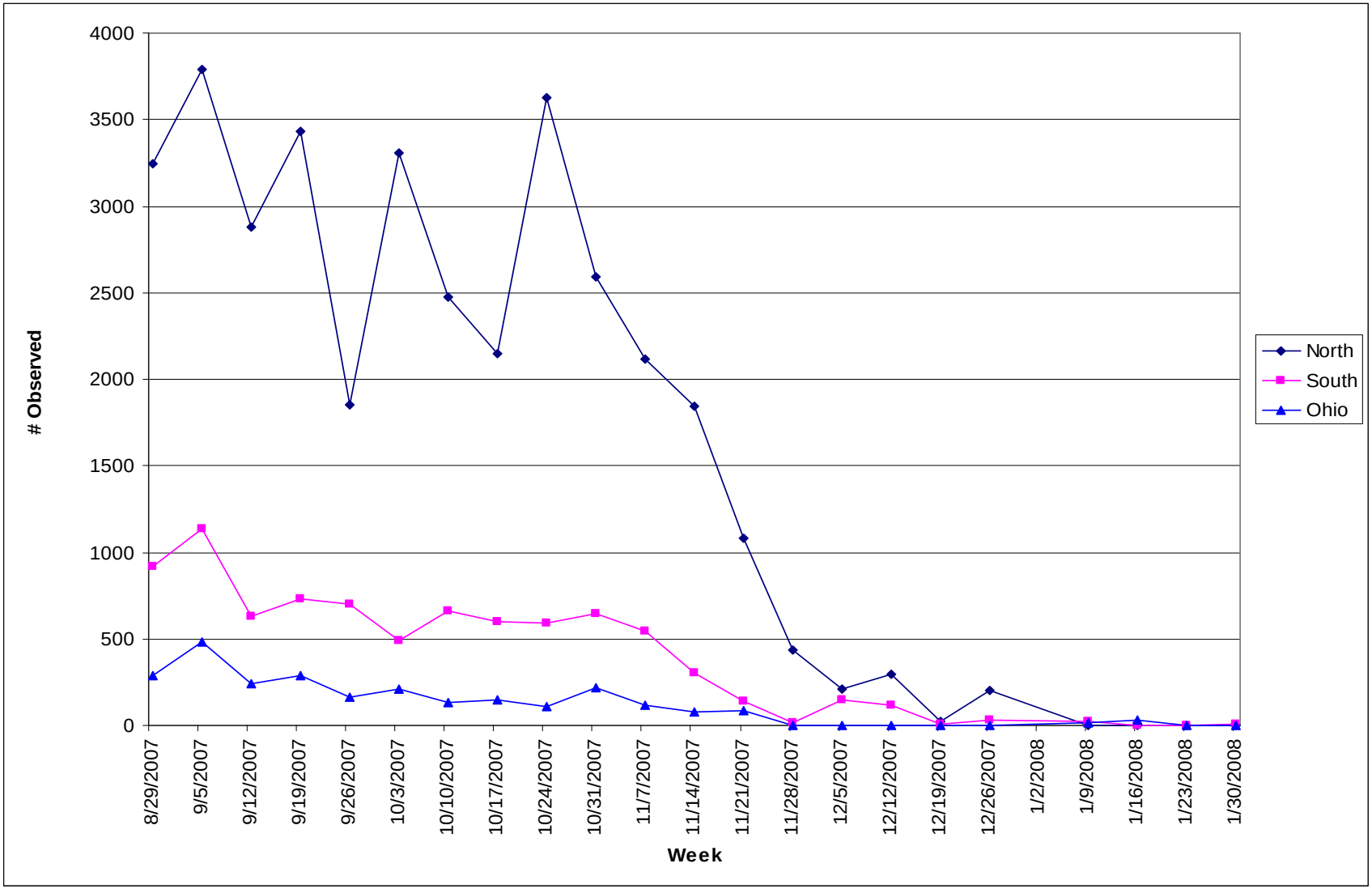

Figure 3. Migration timing of wood ducks in Indiana by zone between 29 August 2007 and 30 January 2008.

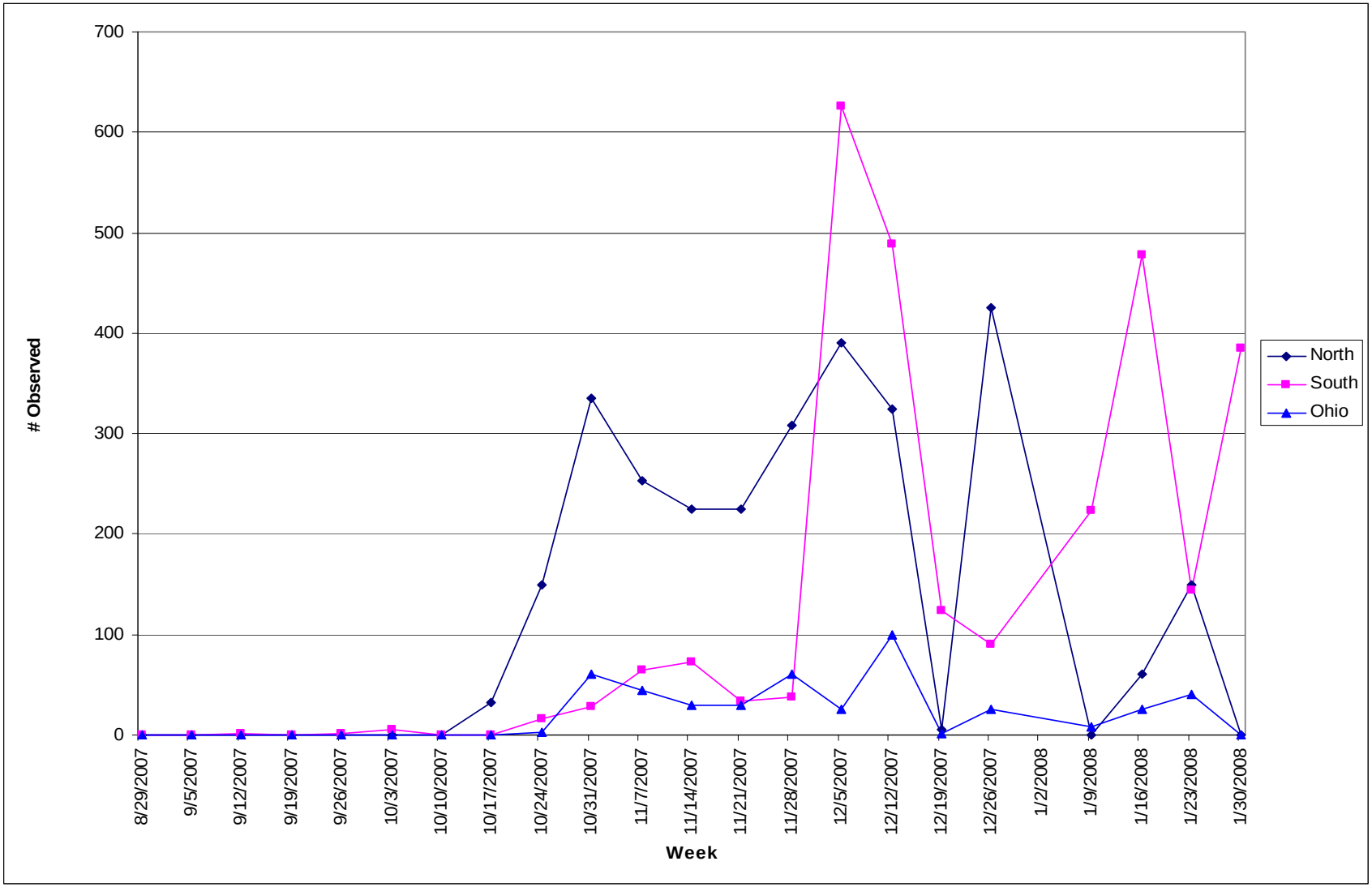

Figure 4. Migration timing of black ducks in Indiana by zone between 29 August 2007 and 30 January 2008.

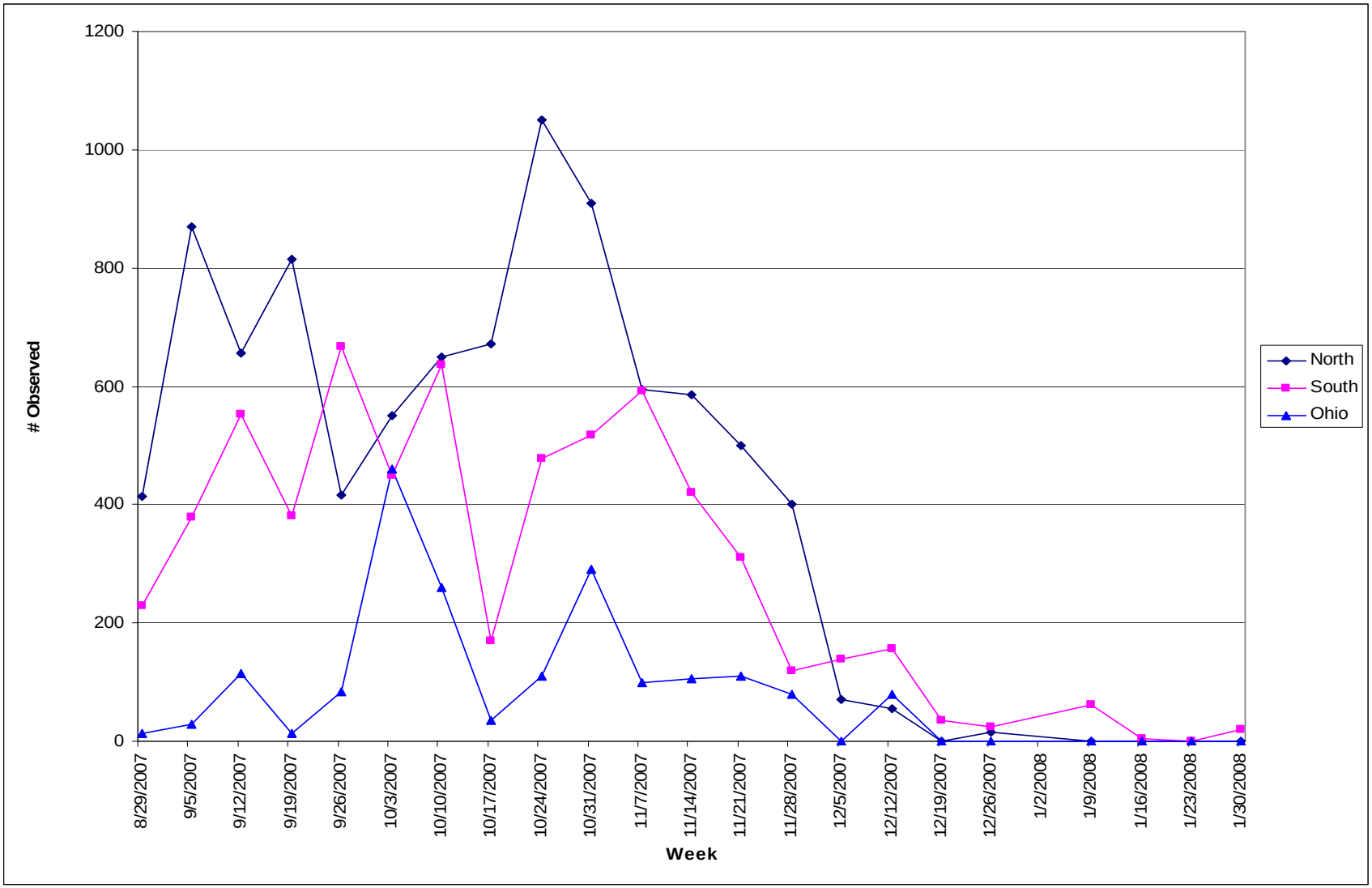

Figure 5. Migration timing of teal (both species) in Indiana between 29 August 2007 and 30 January 2008.

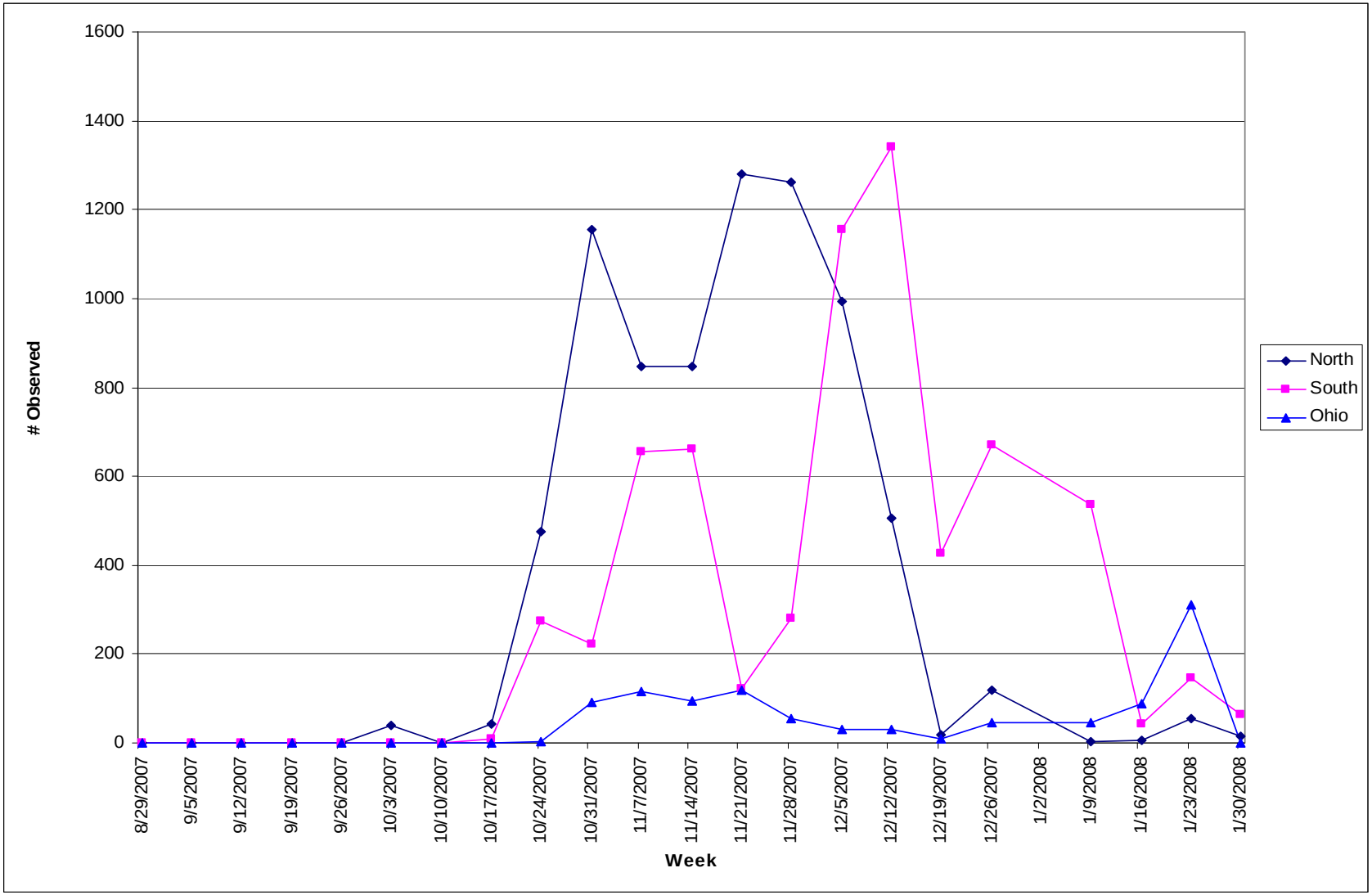

Figure 6. Migration timing of diving ducks in Indiana by zone between 29 August 2007 and 30 January 2008.

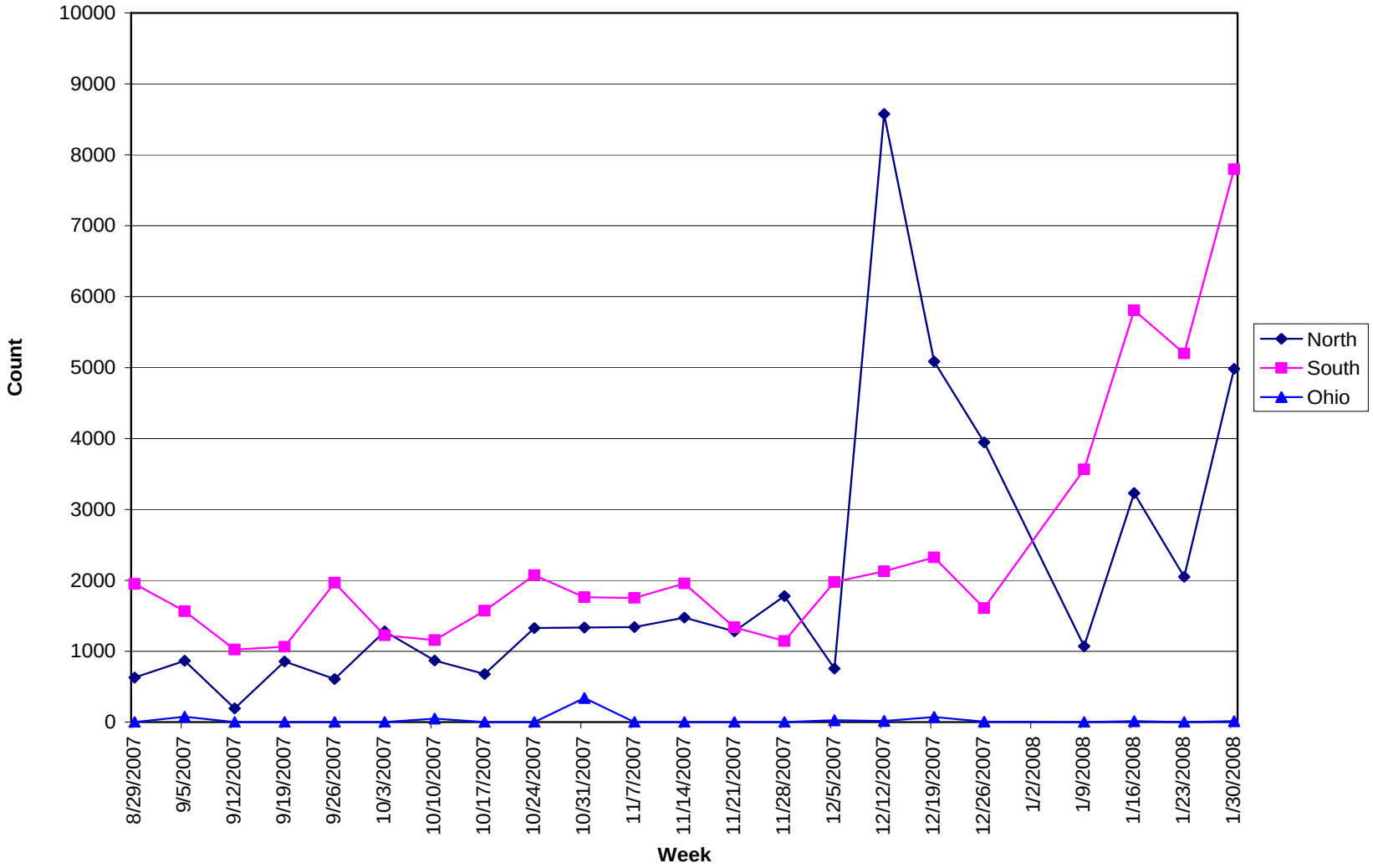

Figure 7. Migration timing of Canada geese in Indiana by zone between 29 August 2007 and 30 January 2008.

Figure 8a. Three year average peak waterfowl counts in Indiana 1985-88 – 2005-08.

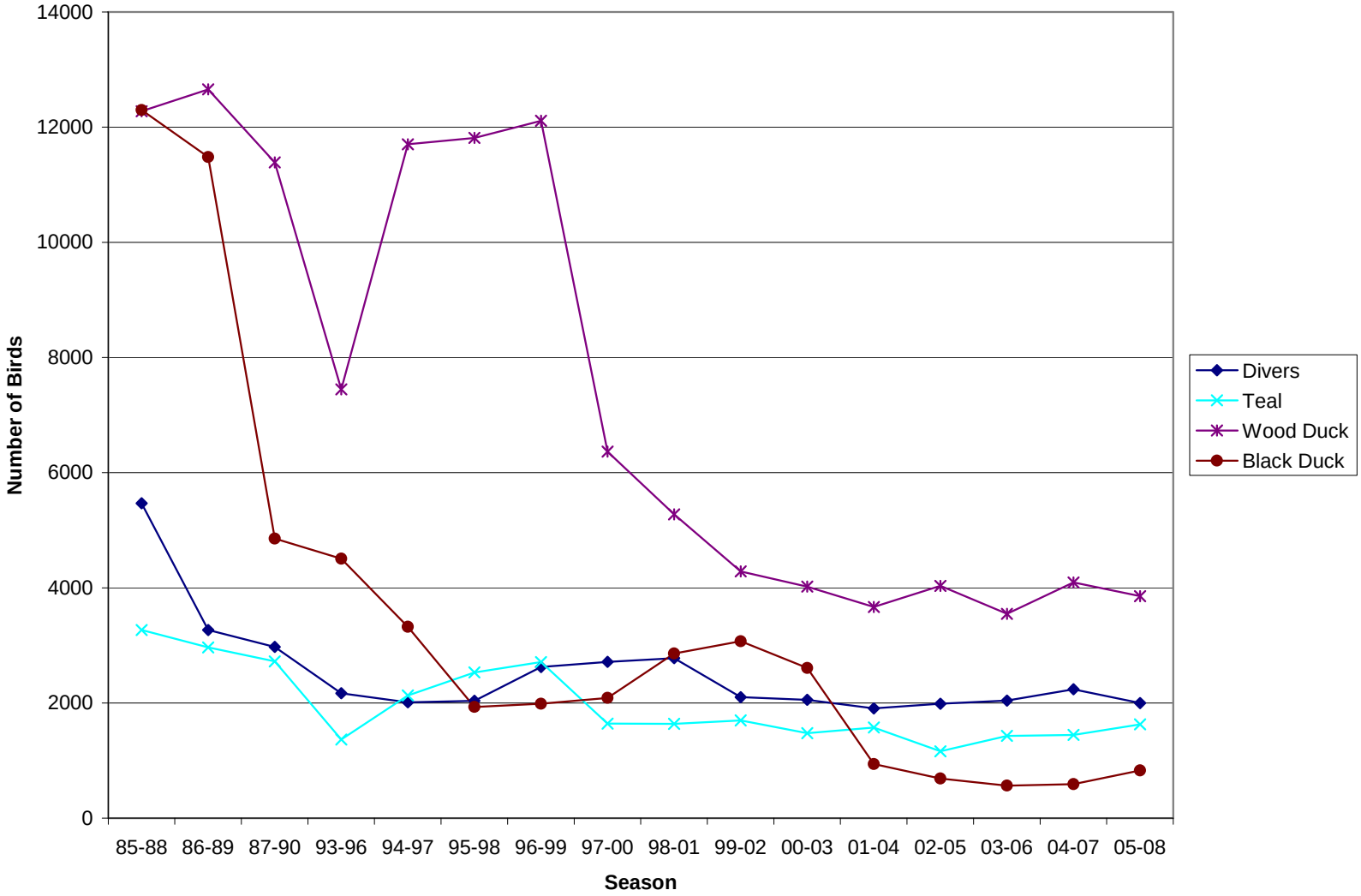

Figure 8b. Three year average peak waterfowl counts in Indiana 1985-88 – 2005-08.

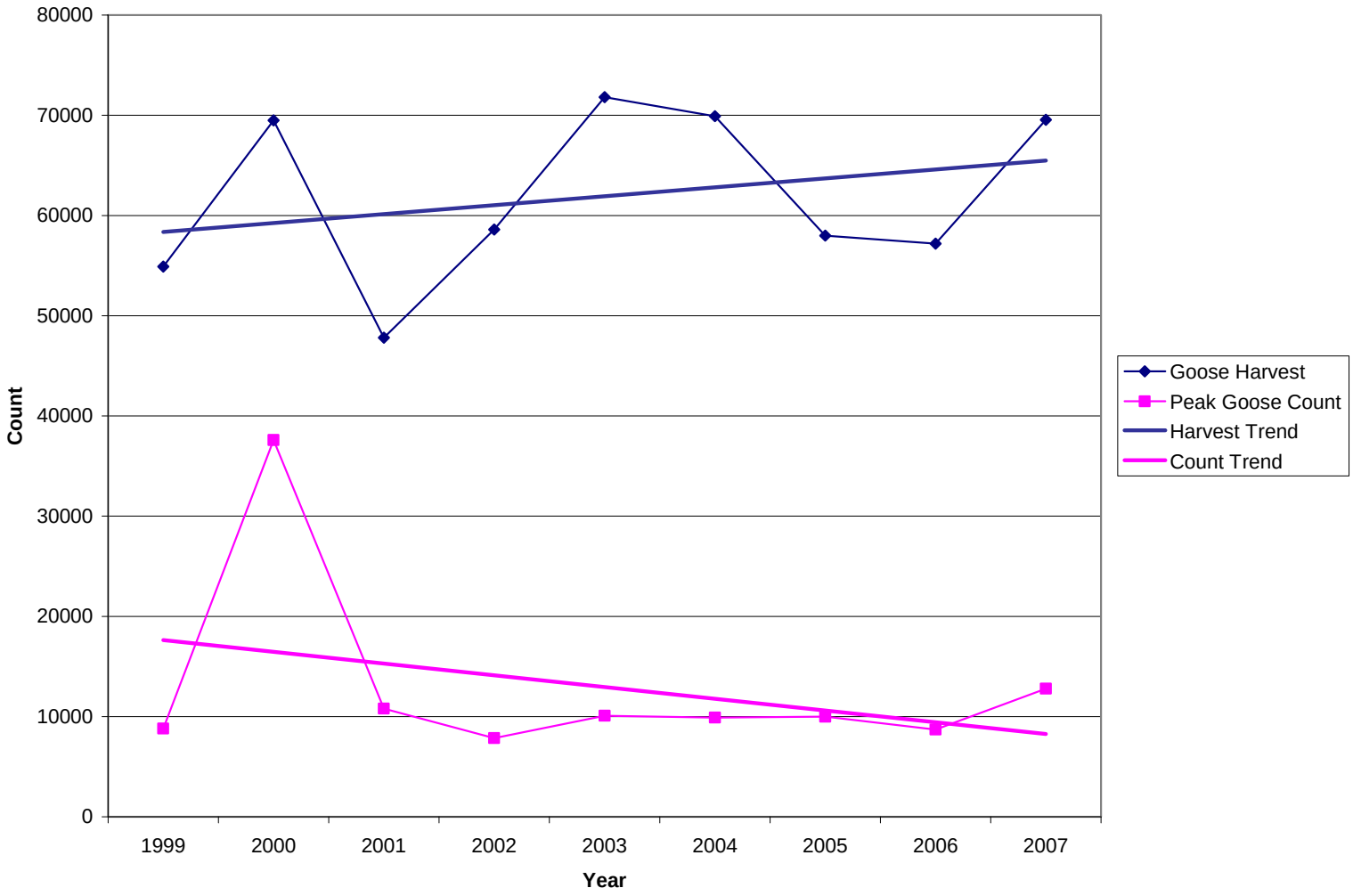

Figure 9. Canada goose harvest and peak survey count (statewide). Harvest is estimated from HIP. Notice that harvest continues to increase despite a decrease in total peak count during the survey. This likely indicates that many birds are not being counted.

Figure 10. Total duck harvest and peak survey count (statewide). Harvest is estimated from HIP. Notice that harvest continues to increase despite a decrease in total peak count during the survey. This likely indicates that many birds are not being counted.

Table 1. Peak waterfowl migration counts on survey areas in Indiana from September through January, 2003-2007.

GROUP/SUBGROUP/SPECIES	2003-04	2004-05	2005-06	2006-07	2007-08	5 Year Avg	Dif 2006/2007	% Change	Dif from 5yr	% Change
ALL DABBLERS	16,101	11,140	22,443	20,718	31,486	20,378	+10,768	+52%	+11,108	+55%
MALLARDS	14,092	8,684	20,064	18,865	25,832	17,507	+6,967	+37%	+8,325	+48%
WOOD DUCK	3,445	4,997	3,489	4,810	5,406	4,429	+596	+12%	+977	+22%
BLACK DUCK	903	412	877	625	1,041	772	+416	+67%	+269	+35%
GREEN-WINGED TEAL	997	411	1,324	1,265	1,102	1,020	-163	-13%	+82	+8%
BLUE-WINGED TEAL	898	994	1,010	1,005	1,117	1,005	+112	+11%	+112	+11%
DIVERS AND MERGANSERS	1,536	4,079	2,349	2,568	2,180	2,542	-388	-15%	-362	-14%
CANADA GOOSE	10,095	9,914	10,039	8,664	12,789	10,300	+4,125	+47%	+2,489	+24%

Table 2. Estimates of total and breeding pairs of Canada geese in Indiana.

Year	Estimated Statewide Population	95% C.I.	Breeding Pairs	95% C.I.
2008	102,700	70,850 – 135,500	49,131	33,900 – 64,360
2007	125,300	87,739 – 162,861	56,375	39,125 – 73,625
2006	175,900	87,277 – 264,163	49,907	10,928 – 88,886
2005	94,979	66,982 – 122,976	33,378	23,960 – 42,796
2004	80,200	50,777 – 109,623	30,839	Not available
2003	95,640	63,808 – 127,472	50,638	30,969 – 70,307
2002	----- NO SURVEY -----			
2001	121,052	72,212 – 169,892	53,391	35,102 – 71,680
2000	121,340	75,219 – 167,461	47,872	33,662 – 62,082
1999	88,966	54,824 – 123,108	37,807	24,490 – 51,124
1998	78,857	56,918 – 100,796	34,655	25,777 – 43,533
1997	87,633	75,555 – 99,711	37,591	32,013 – 43,169
1996	----- NO SURVEY -----			
1995	63,033	39,793 – 86,273	24,005	16,107 – 31,903
1994	69,650	46,350 – 92,950	11,900	6,550 – 17,250
1993	67,491	Not calculated	---	---